RAS J-95

February 11, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
Entergy Nuclear Generation Co. and	)	
Entergy Nuclear Operations, Inc.	)	Docket No. 50-293-LR
	)	
	)	ASLBP No. 06-848-02-LR
(Pilgrim Nuclear Power Station)	)	

AFFIDAVIT OF DR. JAMES A. DAVIS AND ANDREA T. KEIM
IN RESPONSE TO LICENSING BOARD QUESTIONS IN
ORDER (BOARD QUESTIONS FOR THE NRC STAFF AND APPLICANT)

James A. Davis ("JAD") and Andrea T. Keim ("ATK"), do hereby state as follows:

1. (JAD) I am employed by the U.S. Nuclear Regulatory Commission ("NRC") as a Senior Materials Engineer

License Renewal. I am filir

of the NRC Staff ("Staff") in

issued on January 31, 200

2. (ATK) I am

Component Integrity, NRR.

questions asked of the Sta

issued on January 31, 200

3. (JAD, ATK)

one multi-part question rela

relating to the salt service v

including appropriate affida

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of Entergy (Pilgrim Nuclear Power Station)
Docket No. 50-293-LR Official Exhibit No. 95
OFFERED by: Applicant/Licensee Intervenor
NRC Staff Other NRC Staff Exh 27
IDENTIFIED on 4-10-08 Witness/Panel
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk Thibault

DOCKETED
USNRC

April 15, 2008 (10:00am)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Temp=SECY-027

DS03

February 11, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
Entergy Nuclear Generation Co. and	)	
Entergy Nuclear Operations, Inc.	)	Docket No. 50-293-LR
	)	
	)	ASLBP No. 06-848-02-LR
(Pilgrim Nuclear Power Station)	)	

AFFIDAVIT OF DR. JAMES A. DAVIS AND ANDREA T. KEIM
IN RESPONSE TO LICENSING BOARD QUESTIONS IN
ORDER (BOARD QUESTIONS FOR THE NRC STAFF AND APPLICANT)

James A. Davis ("JAD") and Andrea T. Keim ("ATK"), do hereby state as follows:

1. (JAD) I am employed by the U.S. Nuclear Regulatory Commission ("NRC") as a Senior Materials Engineer in the Office of Nuclear Reactor Regulation ("NRR"), Division of License Renewal. I am filing this affidavit to respond to the Licensing Board's questions asked of the NRC Staff ("Staff") in the Order (Board Questions for the NRC Staff and Applicant), issued on January 31, 2008.

2. (ATK) I am employed by the NRC as a Materials Engineer in the Division of Component Integrity, NRR. I am filing this affidavit to respond to the Licensing Board's questions asked of the Staff in the Order (Board Questions for the NRC Staff and Applicant), issued on January 31, 2008.

3. (JAD, ATK) The Board ordered the Staff and the Applicant (Entergy) to answer one multi-part question relating to the condensate storage ("CS") system and one question relating to the salt service water ("SSW") system, and provide "thorough technical support . . . , including appropriate affidavits." Our answers to the questions are provided below.

4. (JAD, ATK) Question 1 is a three-part question that relates to the CS system.

a. What is the minimum leakage rate that is certain to be detectable by the testing of the condensate storage tank (CST) water level every four hours, and conversely, what is the maximum leakage rate that would be detected by that testing? Provide a detailed statement of the basis of and sources for your answer.

Staff Response. This question is best answered by Entergy because the Staff does not have access to the detailed procedure for monitoring the CST water level and does not know the set point. However, given those limitations, the Staff is able to make some calculations regarding water level and leakage rate. For example, the CST holds 275,000 gallons of water at the 30-foot height. A 10% drop in water level would be easily detected. This would occur if 27,500 gallons leaked out in four hours, or 115 gallons per minute. If a one-foot drop in height were the limit, that would represent a 9,167 gallon drop or 38 gallons per minute. (Testimony of Alan Cox, *et al.*, on Pilgrim Watch Contention 1, Regarding Adequacy of Aging Management Program for Buried Pipes and Tanks and Potential Need for Monitoring Wells to Supplement Program (January 8, 2008) ("Entergy Testimony") at 49, answer A110).

Each CST has 75,000 gallons of reserve dedicated to the high pressure coolant injection ("HPCI") and reactor core isolation core ("RCIC") systems for a total of 150,000 gallons. The loss of 150,000 gallons in four hours would require a leak rate of 625 gallons per minute. The maximum amount of leakage would be the loss of all CST coolant or 550,000 gallons of coolant. The leakage rate for the loss of 550,000 gallons in four hours would be 2,292 gallons per minute. (Entergy Testimony at 16, A28).

b. What is the minimum leakage rate that is certain to be detected by the quarterly testing of the water flow from the RCIC pump and the HPIC pump, and, conversely, what is the maximum leakage rate that would not be detected by that testing? Provide a detailed statement of the basis of and sources for your answer.

Staff Response. This question is best answered by Entergy because the Staff does not have access to the detailed procedure for the quarterly testing of the water flow from the RCIC and HPCI pumps. However, the water flow tests are conducted by establishing a flow path with suction from the CST and discharge back to the CST. Therefore, any leakage should be detected by a drop in the CST level. (*See* Entergy Testimony at 52, A120). So the Staff's response to this question is similar to the response to question 1a.

> c. What is the smallest leakage rate that could reasonably be expected to challenge the ability of the CSS system piping at issue to fail to satisfy its intended function(s) as relevant for license renewal? Provide a detailed statement of the basis of the sources for your answer.

Staff Response. The CS system, which consists of two large storage tanks and associated pipes and valves, has two functions that bring it within the scope of license renewal under 10 C.F.R. § 54.4. (Pilgrim License Renewal Application ("LRA") § 2.3.4.1 at 2.3-116 and 117; NUREG-1891, Safety Evaluation Report Related to the License Renewal of Pilgrim Nuclear Power Station ("SER") 2.3.4.1, 2-116-117 (November 2007)). That regulation describes the structures, systems or components that are in-scope for license renewal. If a structure, system or component fulfills a function listed in 10 C.F.R. §§ 54.4(a)(1), (a)(2), or (a)(3), then it is within scope of license renewal (ref. 10 C.F.R. 54.4(b)). In other words, it is within the scope of license renewal because it performs any of the functions listed in 10 C.F.R. Part 54.4(a).

The first function, listed under 10 C.F.R. § 54.4(a)(1), is to provide a pressure boundary for the flowpath to the RCIC and HPCI pumps via the safety-related piping and valves that interface with the RCIC and HPCI. LRA § 2.3.4.1. The second function, listed under 10 C.F.R. § 54.4(a)(3), is to "provide a source of water to the HPCI and RCIC systems, which are credited in the 10 C.F.R. part 50, Appendix R analysis for safe shutdown for fire protection (10 C.F.R. § 50.48)." *Id.*

Regarding 10 C.F.R. § 54.4(a)(1), the CS system has no credited safety function in the Licensee's Accident Safety Analyses under scenarios covered in § 54.4(a)(1). Although the CSTs are the preferred source of water to the HPCI and RCIC pumps, they could be completely unavailable (*i.e.*, totally drained due to leakage), yet the safety function would still be achieved by using water from the Torus to supply water to the HPCI and RCIC pumps – the CS system is automatically isolated to prevent CS system faults from affecting HPCI/RCIC performance. Therefore, no CS system leak rate can challenge HPCI/RCIC performance for purposes of 10 C.F.R. § 54.4(a)(1). (*See* Entergy Testimony at 16, A28; NRC Staff Testimony of Terence L. Chan and Andrea T. Keim Concerning Pilgrim Watch Contention 1 (Jan. 29, 2008) at 4, A8 and 5-6, A10; NRC Staff Exhibit 10).

Regarding the 10 C.F.R. § 54.4(a)(3) function, 10 C.F.R. Part 50, Appendix R, requires, in effect, that the CS system would be needed to supply water to the reactor coolant system during a cooldown that could last up to 72 hours. The answer is better provided by Entergy because the Staff does not have the detailed analysis; but it would take a very large leak in the buried piping in order to compromise this requirement. If it is assumed that 150,000 gallons of CST water are required for this fire protection safe shutdown scenario, then CS function would only be challenged if more than 400,000 gallons of water leak out through the buried piping. It must further be assumed that no one notices the missing 400,000 gallons, either through flooding of plant equipment via the HPCI vault, significant water pooling between the CS Tanks and the building, or from unexpected CST low level alarms annunciating in the Main Control Room. If this leakage were to occur during the first 24 hours, that would indicate a leak rate of about 277 gallons per minute.

In sum, there is no CS system leak rate that would challenge HPCI/RCIC performance for purposes of § 54.4(a)(1), and only a very large leak would compromise the performance for purposes of § 54.4(a)(3).

5. (JAD, ATK) Question 2 relates to the SSW system.

> With regard to the salt service water (SSW) system – Explain how any leak in the SSW buried pipes that carry radioactive water from the plant to the canal that dumps into the bay could challenge the ability of the SSW system to satisfy its intended function(s)? For example, is there any correlation between any potential leak in those pipes and any potential plugs in them that might prevent them from discharging water from the SSW, thereby impeding the ability to remove heat from the [reactor building closed cooling water] RBCCW [system]? Provide a detailed statement of the basis of and sources for your answer.

Staff Response. The SSW system has two intended safety functions, which are to provide a heat sink for the reactor building closed cooling water ("RBCCW") system under transient and accident conditions, and is credited in the safe shutdown analysis for fire protection. (Entergy Testimony at 17, A30). By the time the cooling water is in the buried discharge piping, it has completed its intended safety function of providing cooling water for the RBCCW. Therefore, if a leak develops in the discharge piping, it will not affect the intended safety function.

There is no correlation between any potential leak in the buried discharge piping and any potential plugs in them that might prevent them from discharging water from the SSW. The SSW system is designed so that no active component failure nor any single passive component failure, or any other system, can prevent it from achieving its safety objective. There are two loops of discharge piping, so if one were inoperable, the second loop could be used to return the cooling water back to the bay. Each loop can transfer the full heat capacity required for its intended safety objective. (Entergy Testimony at 17, A30, A31; NRC Staff Exhibit 17). Therefore, the system would retain the ability to remove heat from the RBCCW.

The Staff does not believe that there is any credible mechanism for the discharge piping to become plugged. The discharge piping is constructed using carbon steel which is ductile and would deform before it would rupture. In addition, the pressure from the water inside the pipe would keep it from collapsing. But, even if it did become plugged, the second loop is still available to return the water to the bay.

I declare, under penalty of perjury, that the above statements made by me are true and correct to the best of my knowledge and belief.

/Original Signed By/

James A. Davis, PhD.

/Original Signed By/

Andrea T. Keim

Executed at Rockville, Maryland
this 11th day of February, 2008.